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{handwritten}: Fire-proof insulation material comprising mixtures of polyethylene, ethylene-propylene, poly-isobutylene and aluminum hydroxide

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Description: Fire-resistant material

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Publications to be taken into consideration to evaluate patentability:

DT-AS 11 16 325
DT-AS 20 50 581
FR 20 64 395
DT-OS 15 69 063
DT-OS 22 00 985

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Daetwyler AG Schweizerische Kabel-, Gummi- und Kunststoffwerke

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Fire-proof material

The invention refers to a fireproof material and its use as sheath material and/or insulation material for electric cables or lines; its objective is, compared with previously known materials for these applications, a considerable improvement in behavior in extreme heat, particularly in conflagrations.

The technical and economical advantages of plastic cables are generally known. To produce these cables, plastics are used for insulation and protective sheathing. The plastics suitable for cable technology are almost exclusively synthetic, organic polymers. These materials can be destroyed by heat or fire action and can be more or less highly flammable. At different times, fires have already been reported in which plastic cables were involved or affected. A fire in a cable system can have unpredictable consequences. In the process, there is usually failure of the power supply and interruption in transfer and control systems. Heavy smoke development and toxic fire gases make it more difficult for people to escape or be rescued. If halogen-containing plastics are involved in the fire, corrosive gases and vapors are created. The resulting damages caused by the corrosion of machines, electronic appliances, parts of buildings, etc. can exceed the original degree of damage by several times.

To improve the behavior of plastic cables in fires, many efforts have been made thus far. The use of halogen-containing polymers such as polyvinyl chloride, fluoroplastics, chloroprene rubber, etc., represents a good solution to make objects hardly flammable. Flammable polymers are made hardly flammable by adding chlorine and bromine compounds in combination with antimony trioxide. All of these measures help to make objects hardly flammable. In the case of thermic overloading and action of fire, these plastics, as already mentioned, develop more or less large amounts of corrosive gases and vapors. For cables with insulations and sheaths of polyvinyl-chloride, what are known as resisting agents have been developed. There are known sheath materials that contain acid-binding fillers. There are also known resisting agents that foam at increased temperatures and thereby act as heat barriers. These resisting agents develop their full effectiveness only in a limited

temperature range. In an actual fire or in power overloads, the cable can run through the entire temperature range from 150 degrees C to over 1,000 degrees C. The known resisting agents therefore represent only a partial solution to the problem. The previously known plastic mixtures that are hardly flammable, do not have a corrosive effect in fires and are suitable for cables are cross-linkable plastic mixtures. After shaping, such materials must then be subjected to a cross-linkage process. Costly machine installations and power are necessary for this. These cross-linkable plastic mixtures can often only be used as insulation material but not as sheath material. The reason for this is that during cross-linkage of the sheath material, the lead insulating material under it is deformed or otherwise unfavorably affected.

The task of the present invention is thus to create a fireproof material that can be worked with typical thermoplastic extrusion systems, is hardly flammable to a certain degree and, in the event of thermic overloading, does not release corrosive gases and vapors and develops only minimal amounts of fumes. Further, it should not melt from the action of fire and should thereby form a coherent protective layer over the insulated lead or leads and, with regard to its electric and mechanical properties, it should be suitable as a sheath material.

Due to a mixture of filled polymers and auxiliary substances, this fireproof material according to the invention is characterized in that this mixture has a combination of polyethylene, ethylene-propylene rubber, poly-isobutylene and aluminum hydroxide.

The following composition comes under consideration as most appropriate mixture:

Polyethylene	20-60	parts by weight
Ethylene-propylene-polymer	20-60	"
Poly-isobutylene	10-40	"
Aluminum hydroxide	125-250	"
Mineral filler or soot	0-50	"
Softener	5-20	"
Vinyl-hydrosilicon	1-2	"
Antioxidant	1-2	"
Release agent	1-2	"

This mixture can also be cross-linked by adding a suitable peroxide.

The described plastic mixture is workable with normal extruders.

The indicated plastic combination produces a good receptivity for fillers during production of the mixture, good workability of the mixture, and sufficient mechanical and electrical facility of the cable material. Aluminum hydroxide separates water at high

temperatures and causes the material to become hardly flammable.

Using cross-linked polyethylenes or ethylene-propylene rubber as insulating material and the above-mentioned new plastic mixture as sheath material, a new type of cable could be produced. If we compare this new type of cable with regular PVC installation cables of identical dimensions and under identical testing conditions, the following results are obtained in a test that was conducted analogous to Test Regulations No. CEI 332 of the International Electrotechnical Commission, although with a large-caliber gas-burner and 500-volt direct current.

	PVC cable	New type of cable
Electrical operability Flaming time until attaining an insulation resistance of less than 10^3 megohms.	3 - 4 min.	20-25 min.
Fuming	heavy	minimal
Corrosive gases	hydrochloric acid	none

Using this new material as cable sheath material, cables can be produced that do not burn in the event of electric overloading or electric breakdown, that do not self-ignite or transmit the flames when acted on by radiant heat or fire, that remain operable for a certain period, generally 10 - 30 minutes, when acted on by radiant heat or fire, and do not release corrosive gases and vapors and only develop minimal amounts of fumes when acted on by radiant heat or fire.

The use of such hardly flammable, halogen-free cables will be advantageous where increased safety requirements are set for electrical systems. For example: nuclear power plants, computer systems, skyscrapers, industrial plants, subways, etc., in short anywhere one can expect a high density of people, escape possibilities made difficult, or high concentration of real value.

Patent Claims

1. Fireproof material based on a mixture of filled polymers and auxiliary substances, characterized in that this mixture has a combination of polyethylene, ethylene-propylene rubber, poly-isobutylene and aluminum hydroxide.

2. Material according to Claim 1, characterized in that the mixture consists of 20-60 parts by weight polyethylene, 20-60 parts by weight ethylene-propylene polymer, 10-40 parts by weight poly-isobutylene, 125-250 parts by weight aluminum hydroxide, 0-50 parts by weight of a mineral filler or soot, 5-20 parts by weight softener and 1 - 2 parts by weight of each of the following: vinyl hydrosilicon, antioxidant and release agent.

3. Material according to one of Claims 1 and 2, characterized in that a peroxide is added to the mixture.

4. Use of the material according to one of the preceding claims as sheath material and/or insulating material in electric cables or lines.

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